

PRELIMINARY CONSIDERATIONS

Before a traffic control signal is designed it must be determined if the signal is warranted and needed through a review of the volumes, sightlines, accident experience, turning movements, geometry and input from local officials.

Once it is determined that a traffic control signal will be installed it is necessary to perform preliminary analysis to determine geometry, lane arrangement and phasing. The geometric design of an intersection involves several critical decisions about the number and use of lanes to be provided on each approach. Factors to be considered include but are not limited to: the functional classification of the roadway; the proximity of nearby signals; the degree of need for platoon cohesion; level of service and; volume to capacity ratios.

When installing or revising a traffic control signal, the designer must take into account the physical setting in which the signal will be located. Visiting the site to get a “feel for” the area is important so that the designer can understand the landscape and the community in which the design will have to assimilate. An effort should be made to limit environmental impacts while maintaining safety and mobility. The designer should always be cognizant of where signal equipment will be placed in relation to existing appurtenances. A survey may be needed to show above- and underground utilities. Also, test pits may be required depending on information from the survey. If the signal equipment cannot be located without potential utility conflicts, the designer should bring it to the attention of the Division of Traffic Engineering.

In some instances design criteria set forth by the Regulations of the State Traffic Commission are more stringent than those of the Manual on Uniform Traffic Control Devices. In those cases, the Regulations of the State Traffic Commission will govern.

DESIGN VOLUMES

In design projects, volumes are usually projected to some design year in the future, usually a 20 year projection. These future volumes should be used to determine traffic signal phasing, lane arrangements and storage length requirements. Signal timings and cycle length for these future volumes should also be evaluated to verify that proposed phasing and lane arrangements will remain valid. This information is also utilized in air quality analysis.

The traffic signal timings and cycle length needed for when the signal is first turned on should also be determined. These **timings** should be based on operational traffic volumes expected for approximately **three years** after completion of construction (five years \pm after design). The 20 year traffic volumes should be adjusted to operational volumes by any appropriate method to provide for a.m., p.m., other peaks and off peaks, and appropriate timing plans should be included in the project.

Air Quality Assessment is required for projects where the anticipated level of service is D or worse. In those cases, localized carbon monoxide (CO) assessment must be conducted by the Bureau of Policy and Planning to determine air quality conformity.

DUAL TURN LANES

The use of a dual or double turning lane either on two exclusive lanes or on one exclusive lane and a second combination lane should be considered when:

- There is not sufficient space to provide the calculated length of a single turn lane;
- The calculated length of a single turn lane becomes prohibitive;
- The necessary time for a protected left-turn phase becomes unattainable to meet the level-of-service criteria (average delay per vehicle); or
- The volume to capacity ratio is greater than or equal to 0.90.

Dual right-turn lanes do not work as well as dual left-turn lanes because of the more restrictive space available for two abreast right turns. If practical, the designer should find an alternative means to accommodate the high number of right-turning vehicles. For example, a turning roadway may accomplish this purpose. A dual left- or right-turn lane onto an expressway entrance ramp should be discouraged.

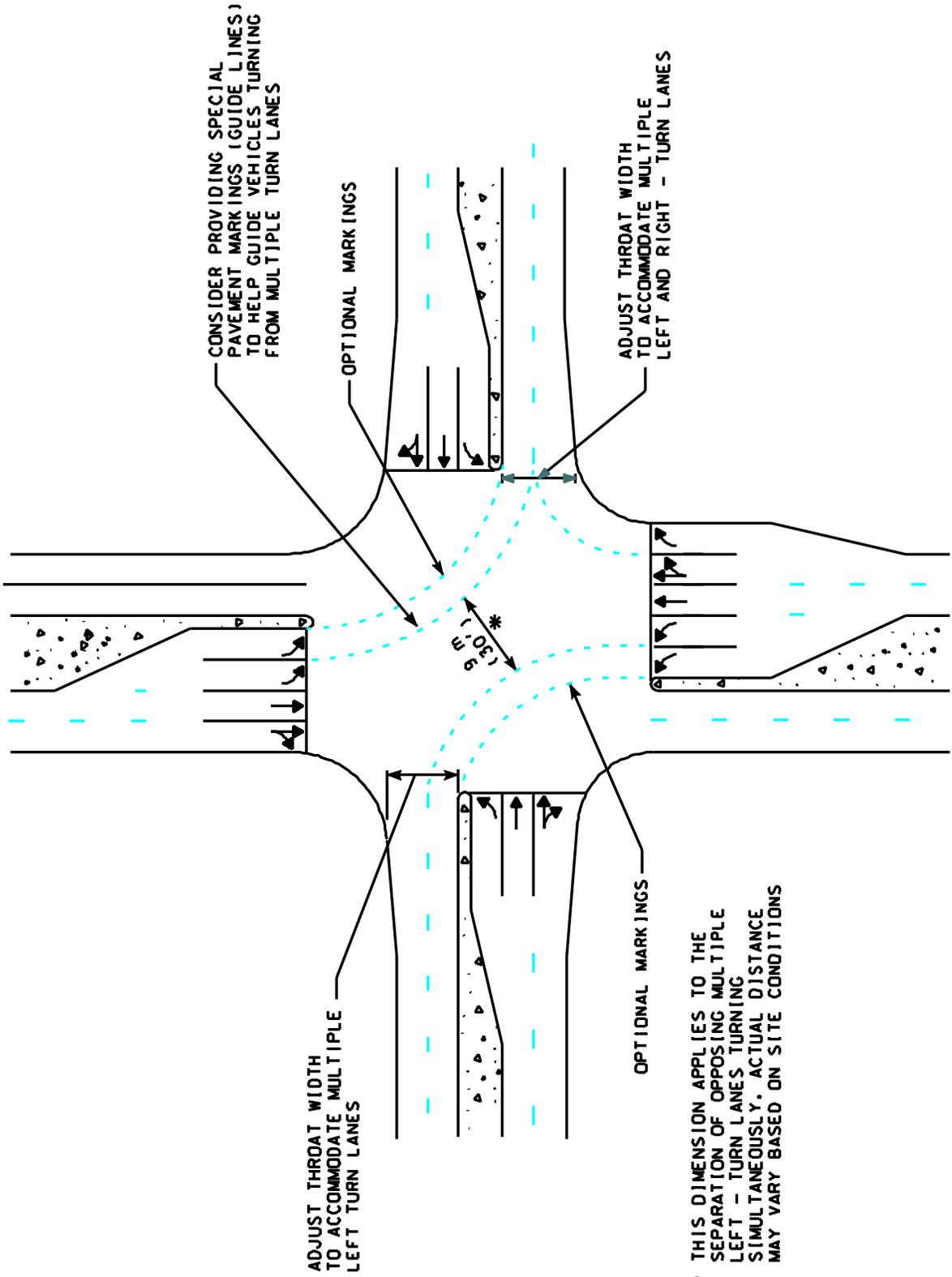
A dual turn lane (both lanes exclusive) can potentially discharge approximately 1.9 times the number of cars which will discharge from a single exclusive turn lane. However, to work properly, several design elements must be carefully considered. The figure on the next page, presents both dual right- and left-turn lanes to illustrate the more important design elements. The designer should consider the following:

Throat Width

Because of the off-tracking characteristics of turning vehicles, the normal width of two travel lanes may be inadequate to properly receive two vehicles turning abreast. Therefore, the receiving throat width may need to be widened. For 90-degree intersections, the designer can expect that the throat width for dual turn lanes will be approximately 9 - 11 m (30-36 ft). If the angle of turn is less than 90-degrees, it may be acceptable to provide a narrower width. When determining the available throat width, the designer can assume that the paved shoulder, if present, will be used to accommodate two-abreast turns. It is also highly desirable to have a center island on the receiving leg of the turn, to provide good definition of the entry throat area.

Widening Approaching Through Lanes

If a 9 m (30 ft) or 11 m (36 ft) throat width is provided to receive dual turn lanes, the designer should also consider how this will affect the through traffic approaching from the other side, see page 9. The designer should also ensure that the through lanes line up relatively well to ensure a smooth flow of traffic through the intersection.



* THIS DIMENSION APPLIES TO THE SEPARATION OF OPPOSING MULTIPLE LEFT - TURN LANES TURNING SIMULTANEOUSLY. ACTUAL DISTANCE MAY VARY BASED ON SITE CONDITIONS

Special Pavement Markings

As illustrated on the previous page, these can effectively guide two lines of vehicles turning abreast. The guide markings are terminated when sufficient guidance is provided. The Division of Traffic Engineering will help determine the selection and placement of any special pavement markings.

Signal Indications

Dual turn lanes provide for major traffic movements and require two signal faces.

Opposing Left-Turn Traffic

If simultaneous, opposing left turns will be allowed, the designer should ensure that there is sufficient space for all turning movements. This is always a factor, but dual left-turn lanes can cause special problems. If space is unavailable, it may be necessary to alter the signal phasing to allow the two directions of traffic to move through the intersection on separate phases.

Turning Templates

All intersection design elements for dual turn lanes must be checked by using the applicable turning templates. The design vehicle will be assumed to be in each lane turning side by side.